

# ARTICLE 34 AMENDMENTS

**AMENDMENT**

(Under Provisions of Section 11 of  
LAW CONCERNING INTERNATIONAL APPLICATION, ETC.  
PURSUANT TO THE PATENT COOPERATION TREATY)

To: Director, Patent Office  
(TAKESHIGE Tatsuo, Examiner at the Patent Office)

1. Identification of the International Application:

PCT/JP2004/007392

2. Applicant

Name: NGK SPARK PLUG CO., LTD.

Address: 14-18, Takatsuji-cho, Mizuho-ku, Nagoya-shi  
Aichi 467-0872 JAPAN

Nationality: JAPAN

Domicile: JAPAN

3. Agent

Name: KOJIMA Seiji,  
Patent Attorney (Reg. No. 9419)

Address: ATSUTA DAIDOSEIMEI-Bldg. 2F 7-26,  
Jingu 3-chome, Atsuta-ku, Nagoya-shi,  
Aichi, 456-0031 JAPAN

4. Items subjected to Amendment:

Claims

5. Details of Amendment:

See attached sheets.

(1) Claims, page 43, Claim 1: "M3, which represents a metallic element of a sintering aid component;" is amended to "M3, which represents a metallic element of a sintering aid component and which is at least one of Fe, Co, Ni, Mg, Zn, and Cu;." "0 < b < 0.5" is amended to "0 < b ≤ 0.25."

(2) Claims, page 44, Claim 5: Deleted.

(3) Claims, page 44, Claim 6: "any of claims 1 through 5" is amended to "any of claims 1 through 4."

(4) Claims, page 44, Claim 7: "any of claims 1 through 6" is amended to "any of claims 1, 2, 3, 4, and 6."

(5) Claims, page 44, Claim 8: "any of claims 1 through 7" is amended to "any of claims 1, 2, 3, 4, 6, and 7."

(6) Claims, page 44, Claim 9: "any of claims 1 through 8" is amended to "any of claims 1, 2, 3, 4, 6, 7, and 8."

(7) Claims, page 45, Claim 10: "any of claims 1 through 9" is amended to "any of claims 1, 2, 3, 4, 6, 7, 8, and 9."

(8) Claims, page 45, Claim 11: "any of claims 1 through 9" is amended to "any of claims 1, 2, 3, 4, 6, 7, 8, 9, and 10."

(9) Claims, page 45, Claim 12: "any of claims 1 through 11" is amended to "any of claims 1, 2, 3, 4, 6, 7, 8, 9, 10, and 11."

(10) Claims, page 45, Claim 14: "any of claims 1 through 13" is amended to "any of claims 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, and 13."

6. List of Appended Document:

(1) Replacement sheets of claims, pages 43 to 45

[Document Name] Claims

[Claim 1] (After amended) A piezoelectric ceramic composition characterized by containing:

metallic element K;

metallic element Na;

metallic element Nb;

M1, which represents a divalent metallic element, or a metallic element combination formally equivalent to a divalent metallic element;

M2, which represents a tetravalent metallic element, or a metallic element combination formally equivalent to a tetravalent metallic element;

M3, which represents a metallic element of a sintering aid component and which is at least one of Fe, Co, Ni, Mg, Zn, and Cu; and

non-metallic element O, wherein, when K, Na, Nb, M1, and M2 constitute the formula  $[(1/2)aK_2O - (1/2)bNa_2O - cM1O - (1/2)dNb_2O_5 - eM2O_2]$ , a, b, c, d, and e in the formula satisfy the following relations:

$$0 < a < 0.5,$$

$$0 < b \leq 0.25,$$

$$0 < c < 0.11,$$

$$0.4 < d < 0.56,$$

$$0 < e < 0.12,$$

$$0.4 < a + b + c \leq 0.5, \text{ and}$$

$a + b + c + d + e = 1$ ; and when the total amount of K, Na, Nb, M1, and M2 as reduced to corresponding oxides is 100

parts by mass, the amount of M3 as reduced to M3 oxide is 5 parts by mass or less.

[Claim 2] A piezoelectric ceramic composition as described in claim 1, wherein, when the total amount of K, Na, Nb, M1, and M2 as reduced to corresponding oxides is 100 parts by mass, the amount of M3 as reduced to M3 oxide is 0.1 parts by mass or less.

[Claim 3] A piezoelectric ceramic composition as described in claim 1 or 2, wherein M1 is at least one of Ca, Sr, Ba,  $(\text{Bi}_{0.5}\text{Na}_{0.5})$ , and  $(\text{Bi}_{0.5}\text{K}_{0.5})$ .

[Claim 4] A piezoelectric ceramic composition as described in any of claims 1 through 3, wherein M2 is at least one of Ti, Zr, and Sn.

[Claim 5] (Canceled)

[Claim 6] (After amended) A piezoelectric ceramic composition as described in any of claims 1 through 4, wherein M3 is a combination of Cu and at least one of Fe, Co, Ni, Mg, and Zn.

[Claim 7] (After amended) A piezoelectric ceramic composition as described in any of claims 1, 2, 3, 4, and 6, wherein a, b, and d in the formula satisfy the following relation:  $(a + b)/d \leq 1.00$ .

[Claim 8] (After amended) A piezoelectric ceramic composition as described in any of claims 1, 2, 3, 4, 6, and 7, wherein a, b, and c in the formula satisfy the following relation:  $0 < c/(a + b + c) \leq 0.20$ .

[Claim 9] (After amended) A piezoelectric ceramic

composition as described in any of claims 1, 2, 3, 4, 6, 7, and 8, which contains, in addition to K, Na, Nb, M1, M2, and M3, metallic element Li, wherein at least one of K and Na in the formula is partially substituted by Li.

[Claim 10] (After amended) A piezoelectric ceramic composition as described in any of claims 1, 2, 3, 4, 6, 7, 8, and 9, which contains, in addition to K, Na, Nb, M1, M2, and M3, metallic element Ta, wherein Nb in the formula is partially substituted by Ta.

[Claim 11] (After amended) A piezoelectric ceramic composition as described in any of claims 1, 2, 3, 4, 6, 7, 8, 9, and 10, which contains, in addition to K, Na, Nb, M1, M2, and M3, metallic element Sb, wherein Nb in the formula is partially substituted by Sb.

[Claim 12] (After amended) A piezoelectric ceramic composition as described in any of claims 1, 2, 3, 4, 6, 7, 8, 9, 10, and 11, which has a perovskite crystal structure.

[Claim 13] A piezoelectric ceramic composition as described in claim 12, wherein perovskite crystals belong to an orthorhombic system.

[Claim 14] (After amended) A piezoelectric element characterized by comprising a piezoelectric member formed of a piezoelectric ceramic composition as recited in any of claims 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, and 13; and at least a pair of electrodes which are in contact with the piezoelectric member.